

Sudan National Mine Action Standards – SNMAS 05.03

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Mine Action Technical Survey

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1. Introduction

Technical survey (TS) is an important activity in land release process and is a detailed and technical and topographical data gathering activities undertaken in Suspected Hazardous Areas and Confirmed Hazardous Areas that are surveyed and reported through non-technical survey (NTS). Technical survey can be conducted as standalone and also as an integrated activity with clearance operations.

Conducting technical survey as part of land release process may require use of different assets, such as Manual, Mechanical or Mine Detection Dogs (MDD) or combination of assets according to the site specific condition and availability and suitability of the type of assets. Therefore, comprehensive TS operational plan should be developed during technical survey operations to ensure safe, effective and efficient use of these assets to achieve expected results and realize effective land release application and outputs.

Application of comprehensive TS may result in recommendation to subsequent conduct of clearance using the most suitable assets and alternatively; TS may result with confidence that there is “no evidence of” hazards in some or all parts of the area and should be reduced, verified and released without being fully or partially cleared.

TS shall always be conducted in such a way that leading to a conclusion for releasing the land without need for clearance or properly identify actual hazard areas for full clearance. But any such conclusion and decision shall be based on proper analysis of reliable data that is previously provided and newly collected during the TS activities.

2. Scope

This SNMAS provides standard guidelines and covers minimum requirements for the management and application of Technical Survey as part of land release process in Sudan. It also outlines the responsibilities and obligations of the NMAC and mine action organizations working in Sudan.

3. Reference

IMAS 08.20, SNMAS 05.01 and SNMAS 05.02

4. Terms and Definitions

For details about terms and definitions used in Technical Survey, Non-Technical Survey and Clearance as part of the land release process; refer to SNMAS 05.01 of Land Release.

5. Technical Survey Requirements

5.1. Principles of Technical Survey

The following Technical Survey principles are applicable and shall be considered by NMAC and mine action organizations working in Sudan:

- a) Technical survey methodology shall satisfy safety requirements.
- b) Technical survey should be a dynamic process of investigation and information gathering, and any new information that is revealed shall be considered as a fact for decision making for further interventions.

- c) Technical survey typically complements non-technical survey; therefore, no technical survey should be conducted unless there is recommendation from NTS on further processing of a SHA or CHA.
- d) To ensure effective and efficient application of technical survey operations, deployment of appropriate technical survey assets shall be decided based on proper assessment and analysis of worksite situation and anticipated hazards in each individual hazardous area.
- e) Technical survey result should justify the needs for subsequent clearance operations.
- f) Targeted TS should be preferred over systematic investigation;
- g) Details of what was found and where, and what was done and where, shall be recorded and reported with sufficient accuracy to satisfy applicable standards and allow meaningful analysis of the type, nature and distribution of contamination within its surrounding environment;
- h) The result of technical survey shall be recorded and reported for further analysis of type, nature and distribution of contamination within the surrounding environment;
- i) Technical survey operations may result on making evidence based decision to add more pieces of contaminated area adjacent to the SHA or CHA that had not been previously identified through NTS;
- j) The quality of TS activity and outputs shall be monitored to allow improvement to technical survey procedures and practice and to establish and maintain confidence in the quality of information provided and the land that is released.

5.2. Conduct of Technical Survey

This is important to conduct technical survey in a systematic manner and in light of NTS information. The mine action organizations accredited in and conducting TS in Sudan shall develop comprehensive and practical operational plan for the implementation of TS, in each individual hazardous area.

Prior to start physical implementation of TS activities, the organization shall collect, review and analyze all available information related to THE hazardous areas that are planned for land release operations. Review and analysis of such information should include information about the ground profile, geography and location, climate, vegetation, obstacles, as appropriate and known the type and density of anticipated contamination in each worksite. This will help to make decision on allocation of appropriate time and use of the most suitable asset for conducting TS operations.

Mine action organization shall ensure that any new information that comes out as part of TS activity is properly recorded and analyzed, such information may require changes to the plan, assets and methodology of TS.

Mine action organizations shall consider the following when planning TS operations:

- 1) Review of all available information relating to the hazardous areas (SHAs, CHAs);
- 2) Analysis of contamination characteristics and typical distribution at the sites within the locality;

- 3) Assessment of the types of contamination likely to be present and their likely density and distribution within the area;
- 4) Confirmation of information collection requirements, as defined in SNMAS, as well as any additional requirements specific to the site or circumstances;
- 5) Consideration of the performance of available assets against the expected contamination types in the technical survey role;
- 6) Identification of areas that would justify targeted investigation, High Threat Areas;
- 7) Development of a technical survey approach that satisfies the principles described in 5.1 above.

5.3. Technical Survey Information and Recommendation

All information identified and collected during TS, shall be recorded in related IMSMA format with required and enough description, analyzed and used as technical specification for appropriate decision, planning and management of either subsequent clearance operations or release of the land without clearance.

As minimum, the following information shall be collected during TS operations:

- a) Definition of the type, condition and extent of hazards, including areas actual hazardous areas and the areas reduced.
- b) Assessment and confirmation of the ground in terms of the soil and metal contamination.
- c) Confirmation and identifying the boundaries of actual mine and or ERW hazardous area for clearance.
- d) The suggested depth of clearance for actual hazardous parts of the area which are subject to full clearance. This shall be clearly indicated in reports and maps.
- e) The assets and resources recommended for carrying out further clearance operations.
- f) Reliable information which should be sufficient to determine and demonstrate providing confidence to the land users that the area reduced through TS is safe and free from mines and ERW hazards.
- g) Additional information for the establishment of priority for future actions.

If the technical survey is conducted as standalone operations, then in addition to the information above, a detailed report and map shall also be prepared for entry into IMSMA.

The technical survey report and map shall reflect the followings:

- a) Control Markers including reference point, bench mark and start point, temporary marking including turning points and boundaries around the area and their bearings and distances.
- b) Location of visible mines and or ERW and the pattern of mines (if known).
- c) Location of any mine and or ERW that are found and destroyed during TS operations;

- d) Boundaries of actual hazardous area for subsequent clearance operations.
- e) Recommendation of use of the most suitable asset for clearance operations.
- f) Prominent natural and man-made features such as high ground, water courses, trees, road, buildings, bridges and more within and in close vicinity to the hazardous area.

5.4. All Reasonable Effort in Technical Survey

All mine action organizations working in Sudan shall at minimum consider the following when conducting TS operations, and shall be part of their Standard Operating Procedures and TS training management package, NMAC shall ensure application of all reasonable effort by mine action organizations and their teams:

- 1) Understand the nature and characteristics of contamination within the area of operations, through reviewing previous hazards reports and conducting fresh NTS;
- 2) Deploy the most suitable assets for conducting TS operations based on the nature, characteristics and possible distribution of explosive hazards in the site;
- 3) Demonstrate that the performance of survey assets as per the hazard types has been assessed, monitored, reviewed and confirmed to be acceptable, and properly reflected in technical survey plans and operations;
- 4) Conduct comprehensive Field Risk Assessment (FRA) and repeat it as soon as new evidence discovered. Refer to annex A of this standard.
- 5) Provide evidence of developing appropriate TS operational plan and updating it based on the available and new information, and analysis of information and evidence;
- 6) Apply appropriate internal quality management; focusing on TS team members, equipment used, procedures applied and information associated with the TS process; and
- 7) Proper decision making based on the analysis and review of all available and new information and evidence.

The application of “all reasonable effort” relies upon an integrated system that addresses all aspects of information management, planning and operations, review and decision-making stages.

6. Role of Technical Survey in Land Release

A robust technical survey process may in many cases provide the ability to reduce the original size of SHA and or CHA. As such the organization shall be able to classify the area based on the presence or absence or “no evidence of” mine and or ERW hazards in the area. This can be achieved through gathering sufficient information using TS assets such as manual, MDD or machinery.

If technical survey resulted in confirmation of “no evidence of” mine and or ERW hazards in a part of or complete SHA and the initial suspicion does not longer exist, then the land should be released and the methods used shall be recorded.

After the review and analysis of previous and new information collected during TS operations, the TS team may reach to a decision to recommend and identify one or more area within initial SHA or CHA to be released through full clearance. The TS team may recommend a buffer zone around the

boundaries of actual hazardous area recommended for cleared. The extent of buffer zone around the actual hazardous area should be site specific and dictated in light of the findings during clearance of area recommended for full clearance.

7. Technical Survey Methodology

7.1. General

Technical survey is the activity of collecting of data using demining technical tools and equipment and analysis of data and information as part of land release process with the main aim to support evidence-based decision making about the effective release of land from mine and or ERW hazards. The data and information shall be made available to the field operations and QM personnel as well as NMAC and mine action organization's senior management to make decision about the most suitable and appropriate TS assets and methodology to be used.

High quality information and proper analysis lead to high quality and confident decision making. In particular, efficient decisions about when to stop technical activity may benefit from the preservation of information about what was found where during the technical survey operation.

With regard to assigning the type of assets and methodology in TS, the following shall be considered:

- a) Safety aspects of the asset;
- b) The probability that the asset will indicate the presence of explosive hazards in the area;
- c) The extent to which the asset will preserve information associated with explosive hazards and other aspects of the surrounding environment;
- d) The speed and cost with which the asset can undertake the technical survey function; and
- e) The suitability of the asset in light of the surrounding environment, infrastructure and climate.

The decision to deploy an asset in a technical survey role should be documented in terms of the suitability of that asset against the assessed hazards type.

7.2. Accreditation of Technical Survey Teams and Assets

Assets used in technical survey operations, shall be accredited as per the requirements of SNMAS 07.02 and related TS accreditation form as described in Annex X of SNMAS 07.02. Accreditation of TS team shall be undertaken to assess and evaluate the capability of TS teams and assets in TS role and operations indicating that the team and assets are able and competent to effectively apply TS procedures, indicate presence of explosive hazards; if present, define hazardous area properly and meet the requirements of Sudan NTSGs and support decision making in relation to land release as a result of TS and the recommended further actions to be taken.

7.3. Classification of Survey Assets

Classification of survey assets should be based upon a combination of an assessment of the logic of asset's performance in indicating the presence of explosive hazards, and the evidence collected during the tests and ongoing operations, in terms of confidence that the asset will indicate the presence of explosive hazards if they are present. NMAC and mine action organizations should make sure that the confidence is based on upon evidence showing that the TS asset is capable of indicating

Over time the confidence level should reflect evidence to a greater extent than logical assessment. In order to do so it should be required that operators collect and report data about the performance of different assets against different hazard types during field operations, as well as any trials.

Confidence levels should be reviewed at appropriate levels to take into account up to date information about the performance of assets.

Where different assets exhibit different confidence levels, authorities may choose to use combinations of assets in order to achieve acceptable cumulative levels of confidence.

7.4. Targeted Investigation

Targeted investigation should be considered as preferred approach of TS using the most suitable asset including manual and or intrusive machine within a CHA that is defined based on direct evidence of presence of mine and or ERW hazards.

Targeted investigation allows the TS team to direct exploratory clearance lanes towards the direct evidences within the CHA, and will be able to deal with the direct evidence, identify and collect more facts and reach to a decision to release some parts or the whole area without further clearance or identify one or more parts of the area for full clearance. In some occasions and based on evidences, the TS team may decide to add some portions of the land into polygon of CHA which had not been covered during NTS.

The TS team may use inside out approach as continuation of targeted investigation where the team will extend the exploratory lanes based on their findings, to the surrounding of the targets identified within the CHA.

Targeted TS should reflect available information about the expected presence of hazard items and take into account analysis of the wider context of contamination within the sites and locality.

To achieve high levels of confidence in the results of technical survey, the survey methodology should be developed to ensure:

- 1) The definition of any target area is based upon an analysis of collected and available information and evidence, and takes into account any appropriate buffer zones;
- 2) Exploratory lanes should not pass through a contamination area without identifying at least one piece of evidence, if contamination is in fact present; and
- 3) The separation of exploratory lanes shall not be so great as to allow survey assets to pass either side of a contaminated area.

The technical survey methodology should be developed to reflect any information about the hazard types that might be present at the site and the type and capability of available survey assets. It should also define the proportion of the ground requiring clearance, and the width, arrangement

and separation of investigation lanes or exploratory lanes and any requirement for follow up by other assets.

7.5. Systematic Investigating

Prior to starting systematic investigation, the review of available NTS information shall be undertaken to determine:

- a) If it is possible to conduct targeted investigation; or
- b) If the collection of additional information through a fresh NTS might allow targeted investigation.

TS teams should always conduct a fresh NTS in hazardous areas to confirm the available NTS information and to collect more data and information, before starting TS activities. The fresh NTS will help the team to define with confidence and analysis of new information, parts of the contaminated area as High Threat Area (HTA) for targeted investigation, and parts of it as Low Threat Area (LTA) for systematic investigation. If it is still found not reasonable to divide the area to the high and low threat area; then systematic investigation approach shall be undertaken, covering entire SHA. This will allow the TS team to find more reliable information through having access to different parts of the SHA and to decide either to recommend clearance operation in some parts of the SHA, or cease the operation and release the land with confidence, back to the community or land users as reduced area.

In light of more evidences found as a result of systematic investigation, the team may reach to decision to change the systematic investigation to target investigation in some parts of the hazardous area.

8. Technical Survey Output

8.1. Documented Information

As minimum the TS outputs shall include documented information that covering the following:

- 1) Documented and topographical definition of hazardous areas, to High Threat Area (HTA) for actual clearance, area reduced and area cancelled;
- 2) Required information for planning the clearance of HTA including recommended clearance assets;
- 3) Evidence collected through the application of all reasonable effort that determine and demonstrate that areas reduced and or cancelled are free from mine and or ERW hazards;
- 4) Adjustments to SHA and CHA boundaries in light of evidence discovered;
- 5) The suggested depth of clearance of the areas identified to contain mine and or ERW hazards;
- 6) Required information for the prioritization of clearance; and
- 7) The resources and or assets to carry out clearance.

8.2. Reduction by Technical Survey

Parts of or the whole CHA or SHA can be reduced and released, following the application of “all reasonable effort” that identify, define and remove all presence and suspicion of explosive hazards, and show that the application of further technical effort would be unreasonable in relation to expected results. For the parts of the hazardous area that needs to be reduced through technical survey, it is necessary to show that the efforts applied could reasonably identify evidence of the presence of mine and or ERW contamination, if present. In order to release the land through TS, the following requirements shall be ensured:

- 1) The scope of assessment of expected mine and or ERW contamination was reasonably sufficient;
- 2) The technical survey assets used and the methodology applied were appropriate to identify the potential contamination.

Applying all reasonable effort is essential to be considered in land release through reduction as a result of technical survey operations. All reasonable effort to be applied to the extent that it can be demonstrated with high confidence that there are “no evidence of” explosive hazards in the area and applying more efforts is unreasonable.

9. Technical Survey Documentation Requirements

The evidence and information collected during TS shall be properly recorded and reported to NMAC in related IMSMA TS format; this forms the documentation requirements of TS and is an essential component of the land release process. Successful and credible land release and evidence based decision making during the land release process mainly relies on the quality of information management including, but not limited to:

- 1) Proper collection of data and information during TS activities;
- 2) Recording and reporting of data and information in the right and approved format, timely;
- 3) Proper data entry in IMSMA;
- 4) Analysis of data and information.

NMAC and mine action organizations shall ensure that technical survey documentation satisfies quality requirements and reflects the needs of all information users.

NMAC shall ensure that there is a proper and well established quality check process regarding the data and information management. The quality check shall include investigation of shortcomings in the quality of technical survey data, information and documentation, and timely corrective and preventive action activities. NMAC and mine action organizations shall compare TS data with the clearance findings, this will help mine action programme of Sudan to objectively review TS process and improve it.

Technical Survey shall include a detailed map of the hazardous area with reference to the Reference Point, Bench Mark and other significant features natural and man-made features. As minimum a TS shall contain the following:

- 1) A title which includes task number and detailed location;
- 2) North direction;
- 3) Scale;
- 4) Polygon or traverse of the area with details of reduced area, cancelled area and area for clearance.

- 5) Information box which includes details about the total size of area and its break down to the size of area for clearance, area reduced and area cancelled, duration of TS activity, details of the team and organization and coordinates of control markers;
- 6) A legend which indicates the symbols used in mine action land release.

If TS is conducted as a standalone activity; the information recorded during technical survey should form part of the documentation required for clearance and for the final release of land either by the same organization or other organization.

10. Technical Survey Team Requirements

The following requirements shall be undertaken by mine action organizations undertaking technical survey operations in the field:

- a) **Training:** Mine action personnel involved in technical survey shall be suitably trained, experienced and qualified.
- b) **Equipment:** Prior to deployment to the field, the organization shall make sure that the teams are properly equipped with appropriate demining tools and equipment, measuring equipment including but not limited to GPS, Camera, Compass, Measuring tape and complete drawing box. Technical survey teams may be part of a demining team which shall be equipped with transportation and medical support as outline in SNMAS 08.03.
- c) **Communication.** The technical survey teams shall be equipped with suitable communication equipment that allows them to maintain communications with their office and liaise with communities and government authorities and stakeholders.
- d) **Medical support and evacuation:** The technical survey team shall be supported with a dedicated medic. The team shall also be aware of the closest available medical facilities and prepare a medical evacuation plan (CASEVAC) for each worksite.
- e) **Stationary:** Technical survey teams shall be equipped with required stationary and standard IMSMA reporting formats.

11. Responsibilities and Obligations

11.1. Sudan National Mine Action Center (NMAC)

NMAC as coordination and regulation body for the mine action programme of Sudan is responsible for the followings:

- a) Develop, manage and maintain standard related to technical survey.
- b) Accredite capable demining organizations for conduct of technical survey.
- c) Manage and maintain Information Management System (IMSMA) to manage and keep the TS documented information.
- d) Analyze TS documented information for planning clearance operations.
- e) Oversee and monitor TS activities and their outputs including quality check of the documented information produced by TS organizations.

- f) Conduct periodic review of TS and clearance findings for continual improvement of land release operations.
- g) Undertake long term monitoring of TS outputs of reduced and cancelled areas to ensure the areas are in use by the land owner and users.
- h) Develop liability policy inclusive of provisions with regard to the TS outputs as part of land release process.

11.2. Mine Action Organizations

All mine action organizations intend to undertake TS as part of land release operation in Sudan shall:

- a) Obtain accreditation from NMAC to conduct technical survey activities in Sudan.
- b) Meet the requirements of SNMAS, terms of contract and other regulations issued by NMAC with regard to land release in Sudan.
- c) Develop SOPs and training management package for TS and include the principles of TS as outlined in this SNMAS.
- d) Undertake and apply all reasonable effort in TS operations.
- e) Develop and maintain TS capacity.
- f) Provide reports and make available technical survey related documentation as required by this SNMAS and as specified by NMAC.
- g) Establish and maintain proper community liaison throughout TS activities and involve them in relation to their priorities and the decisions made as a result of applying all reasonable effort.
- h) Provide feedbacks related to comments from NMAC in terms of quality, timeliness and content of the technical survey reports and documented information.